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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/062,858
Filing Date: February 05, 2002
Appellant(s): ELDRIDGE ET AL.

Bronwyn A. Walvaert
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed December 6, 2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

However, it should be noted that this instant application is a divisional of an earlier application 08/448,697 and there was a Board's decision in this '697 application (Appeal No. 1998-1163). The examiner's rejection was affirmed.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The appellant's statement in the brief that each of the claims are separately patentable, i.e., they do not stand or fall together, however, Appellants fails to present reasons in support thereof. Therefore, the claims in each ground of rejections should stand or fall together.

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,268,127	Wu	12-1993
5,284,990	Peterson et al	02-1994
3.488,920	Hutchinson	01-1970
JP 57-92,502	Oda et al	06-1982

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 7, 13-14, 16-20, 46-50, 67-71, 74-81 are rejected under 35 U.S.C. § 103 as being unpatentable over Wu (5,268,127) in view of Peterson et al (5,284,990).

Wu teaches that recently, more stringent environmental regulations have prompted a new look at methods of storing and processing hydrofluoric acid. Specifically, researchers have investigated possible solvents which could be used to dilute the hydrofluoric acid (thus rendering it safer) while preserving its commercial useful characteristics (note column 1, lines 42-47). Wu further teaches that diluting HF with tetrahydrothiophene-1,1-dioxide (also referred to as sulfolane) overcomes the fuming tendency of the HF and makes handling and storing the HF both easier and safer. Furthermore, even if the mixture is accidentally released from its containment facility, the HF tends to remain in the liquid solution rather than to form a dense vapor cloud (note column 1, line 65 to column 2, line 2). This fairly teaches that the mixture of HF and sulfolane is stored in a closed containment facility in liquid form. The solution of HF and sulfolane containing from about 1 to about 99 weight percent HF, more typically from about 10 to about 90 weight percent HF (note column 3, lines 8-12). These ranges overlap the claimed range of as required in the instant claim. The subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness, see In re Malagari, 182 U.S.P.Q. 549. As disclosed in the Example 2, the HF/sulfolane ratio is 1/1 and the temperature is 85°F (note Table 1 in column 4), these values are well within the claimed ranges.

For the pressure of the containment facility, in Example 2, the HF/sulfolane loading was accomplished at liquid nitrogen temperature through a pressure regulator into a Teflon coated stainless steel autoclave (note column 3, lines 56-60), this disclosure fairly suggests that the pressure in the autoclave (i.e. the containment facility) is higher than the atmospheric pressure in order to keep the HF in liquid form. Since Wu fairly teaches the desire of storing the HF/sulfolane in liquid form as well as the hazard of accidental release of HF, it would have been within the skill of the artisan to optimize the pressure of the HF/sulfolane mixture in the containment facility to maintain such mixture in liquid form while minimizing the hazard of HF in the event of an accidental release by minimizing the amount of HF/sulfolane mixture which would be released from the containment facility, i.e. one of ordinary skill in the art to try to maintain the pressure in the containment facility as close to atmospheric pressure as possible while maintaining the HF/sulfolane mixture in liquid form since the smaller the difference between the two pressures, the lesser amount of HF would be released. Also, it would have been obvious to one of ordinary skill in the art to minimize the pressure in the containment facility while maintaining the HF/sulfolane in liquid form because pressure vessel would be required to store the HF/sulfolane at high pressure and the higher the pressure, the higher capital cost for the pressure vessel.

It would also have been obvious to one of ordinary skill in the art to not fill the containment facility to the maximum capacity with HF/sulfolane mixture in order to avoid overfill the containment facility, i.e. to avoid accidental release of HF due to overfilling the containment. Thus, the partial pressure of hydrogen fluoride in the containment

facility of Wu would inherently be less than 100 molar percent and less than that of the pure HF as required in the instant claims.

The difference is Wu does not teach specifically the step of transporting HF/sulfolane mixture in a closed volume selected from the group consisting of a tank car and a tank truck.

As stated in Wu, the environmental regulations become more stringent for storing and processing hydrofluoric acid (note column 1, lines 42-44), thus, it would have been within the skill of the artisan to avoid and to mitigate any accidental release of HF at all time, not only from processing, handling, storing steps, but also from HF transporting step. As for the tank cars, tank trucks and portable vessels as transporting means for HF, the examiner takes official notice that they are conventional means in the art to transport HF.

In any event, Peterson et al reference is applied to teach the desire in the art to control any accidental release of HF during its transportation and the use of tank cars or tank trucks as transporting means. Peterson et al teach that in response to the growing concerns over HF alkylation, several refiners have added mitigation equipment to their HF alkylation units to minimize potential releases of HF outside the units. However, such HF release mitigation equipment installed in a refinery cannot protect against an HF release during unloading operations or from a rupture of trucks or railroad tank cars loaded with HF during transportation of HF to the refinery (note column 1, lines 31-34 and 43-47). Thus, Peterson et al fairly teach the possibility of an accidental release from tank car or tank trucks during the transportation of HF and the desire in the art to

control any accidental HF releases not only in HF alkylation plant, but also when HF being transported or unloaded. During the transportation of HF in tank cars or tank trucks, it would have been obvious to one of ordinary skill in the art to keep the HF in liquid state because liquid state would occupy less space.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to apply the teaching of Wu, i.e. forming a mixture of HF/sulfolane to minimize the HF tendency of forming vapor cloud when HF is accidentally released, to the transportation of HF in tank cars and tank trucks as suggested by Peterson because Peterson teaches the desire in the art to control accidental HF release during transportation of HF as well as when HF being stored or used in the refinery and because of the stringent environmental regulations as recognized by both Wu (note column 1, lines 42-44) and Peterson (note column 1, lines 26-30).

Claims 2-6, 8-12, 15, 21-45, 51-66 are rejected under 35 U.S.C. § 103 as being unpatentable over Wu, in view of Peterson et al as applied to claims 1, 7, 13-14, 16-20, 46-50, 67-81 above, and further in view of Hutchinson.

The difference not yet discussed is Wu does not teach the HF/sulfolane separating step. It should be noted that the sulfolane is used as solvent for the HF acid in Wu et al to facilitate the handling and storing of HF. Wu also teaches that HF is useful in such diverse fields as isoparaffin-olefin alkylation, fluorination, semiconductor manufacture, etc. (note column 1, lines 15-18). Thus, when pure HF, i.e. HF without sulfolane, is needed for catalyst use or any other uses, it would have been obvious to

one of ordinary skill in the art to separate the solvent from the HF by any conventional means.

Hutchinson discloses a solvent extraction of HF-containing mixtures (note title). Hutchinson teaches that HF can be readily recovered from the tetrahydrothiophene-1,1-dioxide (sulfolane) solvent by the application of heat, i.e. stripping operation. Since HF solubility in sulfolane decreases as the temperature and/or the pressure increase as shown in Table 1 (note column 4), it would have been obvious to one of ordinary skill in the art to optimize the condition of the stripping operation to obtain the desired purity of the HF product, In re Aller 105 USPQ 233. Without a showing of criticality or unexpected results, the weight ratio of sulfone to HF or HF to sulfone as required in the instant claims 3-4 are not seen as a patentable distinction because such results can be produced by optimizing the stripping process of Hutchinson.

As for reusing the sulfolane, Hutchinson teaches that sulfolane product is a product worth reusing (note column 3, lines 69-70). In any event, it would have well within the skill of the artisan to reuse the sulfolane as the solvent for the HF because it would save raw material cost.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to use the process of Hutchinson to separate the HF from the HF/sulfolane mixture as disclosed in Wu when pure HF is needed because sulfolane is only a solvent for facilitating the safety of handling and storing HF and because it would have been well within the skill of the artisan to use a known HF/sulfolane separation process (i.e. process of Hutchinson) to separate HF from sulfolane as desired in Wu.

Claims 1-81 are rejected under 35 U.S.C. § 103 as being unpatentable over Wu '127 in view of JP 57-92,502 and Hutchinson (3,488,920).

Wu '127 is applied as stated above.

The differences are (1) Wu '127 only teaches forming the mixture of sulfolane and HF to facilitate storage, not for transporting of HF and (2) Wu '127 does not disclose the step of separating HF from the sulfolane.

For difference (1), JP '502 discloses a method for storage and transportation of hydrofluoric acid (note title). In order to safely store and transport HF, the hydrofluoric acid is reacted with pyridine to form a complex, which has low HF vapor pressure. The complex is distilled at the desired time and place to obtain hydrofluoric acid (note English abstract). The HF can be transported anywhere in a conventional container (note English abstract). Thus, JP '502 fairly suggests that the same method for facilitating safe storage of HF can also be used for safely transporting HF.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to transport the mixture of HF and sulfolane as disclosed Wu '127 as suggested by JP '502 because JP '502 teaches that it is desirable to safely transport HF as well as to safely store HF.

For difference (2), Hutchinson is applied as stated above to teach that HF can be separated from the sulfolane.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to use the process of Hutchinson to separate the HF from the

HF/sulfolane mixture as disclosed in Wu when pure HF is needed because sulfolane is only a solvent for facilitating the safety of handling and storing HF and because it would have been well within the skill of the artisan to use a known HF/sulfolane separation process (i.e. process of Hutchinson) to separate HF from sulfolane as desired in Wu.

(11) Response to Argument

1. The 103 rejection of claims 1, 7, 13-14, 16-20, 46-50, 67-71, 74-81.

Appellants argue that Wu '127 states that "HF/sulfolane loading was accomplished at liquid nitrogen temperature through a pressure regulator", and the containment pressure of a sulfone and HF mixture of less than 30 psig, as claimed in Appellants' claims, constitutes a patentable improvement over Wu '127.

It should be noted that the final pressure inside the vessel does not have to be the same as the "loading" pressure. As stated in the above rejection, one of ordinary skill in the art would have found it prima facie obvious to optimize the conditions within the tank car (or vessel) to maintain the HF/sulfolane mixture in the liquid state while minimizing the potential release of HF in the event of an accident, In re Boesch, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980); In re Aller 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Appellants argue that Peterson patent teaches away from the Wu patent by indicating that the only way to resolve safety problems associated with transportation of HF is not to use HF.

Appellants' argument is noted, however, the way to resolve safety problems as suggested by Peterson is only applicable to the process disclosed in Peterson, and not in all chemical processes, HF could be replaced by sulfuric acid. Thus, the problem associated with transportation of HF is still a problem to be solved.

Appellants argue that Wu discloses HF storage and the transportation of a closed volume containing a hydrogen fluoride and sulfone liquid mixture using a tank car or a tank truck, as claimed, defines a patentable improvement over Wu.

In Wu '127, the mixture of HF/sulfolane is for storing the HF, however, as it would have been obvious to one in the art to transport HF as a mixture of HF/sulfolane because Peterson recognizes the need of transport HF and the need to confine the HF when there is an accidental spill and because the mixture of HF/sulfolane as disclosed in Wu '127, when spilled, HF remains in the liquid solution which would be contained much easier than when HF becomes a vapor stream.

Appellants argue that the maintenance of a vapor space within the tank car/tank truck closed volume containing HF/sulfone mixture as claimed in the instant application, constitutes a patentable improvement over Wu.

It would have been prima facie obvious for one of ordinary skill in the art to underfill the tank car to minimize the possibility of accidental spillage during transport. Moreover, the tank cars are not filled to 100% capacity as a result of the unloading process or the need for only a partial amount of HF at the refinery.

Appellants argue that Peterson does not teach the use of sulfone as an HF diluent.

Peterson '990 is applied to teach the desire of controlling the accidental release of HF during transportation of HF, not to teach the use of sulfone as HF diluent.

Appellants argue that the two references are not combinable because they teach away from each other.

It should be noted that even though Peterson does suggest replacing HF with sulfuric acid but this suggestion only applies to an alkylation process, not for all processes. Furthermore, regardless of whether or not HF is replaced with sulfuric acid for the alkylation process, Peterson still fairly teaches the possibility of an accidental release of HF from tank cars or tank trucks during transportation of HF and the desire to control or minimize such accidental release.

Appellants argue that the two references do not disclose the vapor space requirement of the closed volume containing a liquid HF/sulfone mixture.

Since both references concern about accidental release of HF, they fairly suggest that the release of HF from any source should be prevented. When HF or HF/sulfolane mixture is being stored or transported in a closed volume such as tank cars or tank trucks, it would have been obvious to one of ordinary skill in the art to not overfill the closed volume, thus creating a vapor space therein, as required in Appellants' claims, in order to prevent accidental release of HF.

Appellants argue that there is no motivation to combine Wu, Peterson and Hutchinson references.

As stated in the above rejection, it would have been obvious to one of ordinary skill in the art to transport HF in tank cars or tank trucks (as disclosed in Peterson) in the

form of HF/sulfolane mixture, as disclosed in Wu because such mixture would be easier to contain in case of an accidental spill and when the HF/sulfolane mixture arrived to the final destination, and to be used in a chemical process as HF, such as at the site of the process of Hutchinson, HF can be separated from the sulfolane by the process of Hutchinson.

2. The 103 rejection of claims 2-6, 8-12, 15, 21-45 and 51-66.

Appellants argue that the HF transport method, as claimed in Appellants' claims, is a patentable improvement over Wu and Peterson and provides evidence of a long felt need of safely transporting HF.

Appellants' argument is not persuasive for the reasons as stated above. Moreover, Appellants have not provided any evidence to support the alleged "long felt need".

Appellants urge that separating HF from sulfone at a destination point, after being transport there from an original point, is a patentable improvement over Hutchinson.

As stated in the above rejection, Wu '127 discloses that the addition of sulfolane to the HF is to facilitate the handling and storing of HF. Thus, when only HF is required for a given chemical process, it would have been obvious to one skilled in the art to separate the HF from the sulfolane by using any known method, such as the method as suggested by Hutchinson.

Appellants argue that there is no motivation to combine to Wu, Peterson, and Hutchinson references.

Motivation to combine these references is clearly stated in the above rejection and comments.

3. The 103 rejection of claims 1-81.

Appellants argue that JP '502 teaches reacting HF with a pyridine to form a complex. It does not disclose mixing HF with sulfone. Furthermore, transporting an HF/pyridine complex safety does not make it obvious that an HF/sulfone mixture could be transport safely as well.

In JP '502, even though JP '502 does not disclose an HF/sulfone mixture, however, JP '502 teaches that HF is made to react with pyridine to from a complex because the formed complex has low HF vapor pressure and high safety and can be stored or transported to anywhere in a conventional container. Thus, it would have been obvious to one skilled in the art to use the HF/sulfolane in transporting the HF because (1) the HF/sulfolane has less fuming tendency, which is similar to the "low HF vapor pressure" as desired in JP '502, and (2) when a mixture or complex is safe enough to be stored, it is safe enough to be transported as suggested by JP '502.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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Primary Examiner
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N. M. Nguyen
January 10, 2005

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